COMPAQ

AlphaServer GS60E and GS140

Getting Started with Logical Partitions

Order Number: EK-TUNLP-SF. B01

This document describes the hardware configuration rules and the console firmware commands and environment variable settings needed to run multiple instances of an operating system on *Compaq AlphaServer* GS60E and GS140 systems.

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Preface

Intended Audience

This manual is written for anyone wishing to understand the concepts and requirements of logical partitions for a *Compaq AlphaServer* GS60E or GS140 system, as well as how to use the console firmware to define them.

Document Structure

This manual uses a structured documentation design. Topics are organized into small sections for efficient online and printed reference. Each topic begins with an abstract. You can quickly gain a comprehensive overview by reading only the abstracts. Next is an illustration or example, which also provides quick reference. Last in the structure are descriptive text and syntax definitions.

This manual has five chapters, as follows:

- **Chapter 1, Introduction,** gives an overview of logical partitions.
- **Chapter 2, Configuration Rules**, describes the hardware you need to run logical partitions.
- **Chapter 3, Environment Variable Settings,** describes the environment variables used to define logical partitions for an operating system.
- **Chapter 4, Setting Up, Initializing, and Booting Logical Partitions,** describes the sequence of console firmware commands you need to use to enable logical partitioning and boot/install the operating system.
- **Chapter 5, Tips and Troubleshooting**, gives pointers on how to perform common operations, correct problems, and run tools to debug a partition.

System Options

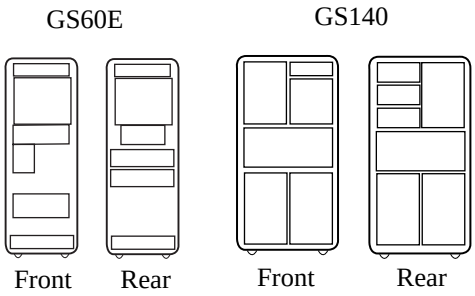
The *Systems and Options Catalog* describes all options for *AlphaServer* GS60E and GS140 systems. In addition, *Compaq* maintains a list of the latest supported options on the Internet, which you can access as follows:

Using a Web browser, follow links from the URL:

http://www.compaq.com/alphaserver/

Conventions Used in This Document

Icons. Icons similar to those shown below are used in illustrations for designating part placement in the system described. A shaded area in the icon shows the location of the component or part being discussed.



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Documentation Titles

Tables 1 and 2 list the books in the *AlphaServer* GS60E and GS140 documentation set and operating system documentation that you may find useful. Table 3 lists related software manuals.

Table 1 Related *AlphaServer* GS60E Documentation

Title	Order Number
Operations Manual	EK–GS60E–OP
Installation Guide	EK–GS60E–IN
Service Manual	EK–GS60E–SV
H7506 Installation Card	EK–H7506–IN
RRDCD Installation Card	EK–RRDXX–IN
GS60/8200 to GS60E Upgrade Manual	EK–GS60E–UP
Release Notes	EK–GS60E–RN
KFE72 Installation Guide	EK–KFE72–IN

Table 2 Related *AlphaServer* GS140 Documentation

Title	Order Number
Hardware User Information and Installation	
Operations Manual	EK–T8030–OP
Service Information Kit	QZ–00RAC–GC
Service Manual	EK–T8030–SV
Reference Manuals	
System Technical Manual	EK–T8030–TM
System Technical Manual Supplement: CPU	EK–T8030–TS
System Technical Manual Supplement: Memory	EK–MS7CC–TS
DWLPA/DWLPB PCI Adapter Technical Manual	EK–DWLPA–TM

Table 2 Related *AlphaServer* GS140 Documentation (Continued)

Upgrade Manuals	
KN7CG CPU Installation Card	EK–KN7CG–IN
MS7CC Memory Installation Card	EK–MS7CC–IN
KFTHA System I/O Module Installation Card	EK–KFTHA–IN
KFTIA Integrated I/O Module Installation Card	EK–KFTIA–IN
AlphaServer 8400 Upgrade Manual	EK–T8430–UI
DWLPA/DWLPB PCI PIU Installation Guide	EK–DWL84–IN
KFE72 Installation Guide	EK–KFE72–IN

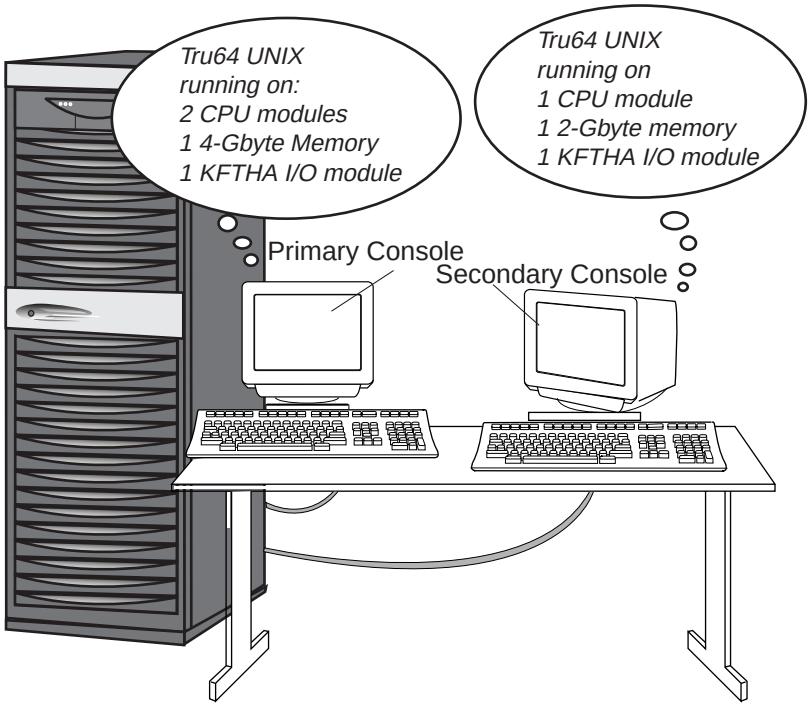
Table 3 Related Software Manuals

Software Manuals	
Tru64 UNIX Installation Guide	
Tru64 UNIX System Administrator's Guide	
Tru64 UNIX Release Notes	
DECevent Installation Guide	AA–DECUX–IN

Chapter 1
Introduction

Partitioning is defined as the capability to run multiple copies, or *instances*, of an operating system on one hardware system. Each instance is maintained at a separate console monitor, as shown for two partitions in Figure 1–1. The *Compaq AlphaServer* GS140 system supports up to three partitions; the *Compaq AlphaServer* GS60E supports two partitions.

Figure 1–1 Maintaining Multiple Instances at Separate Consoles



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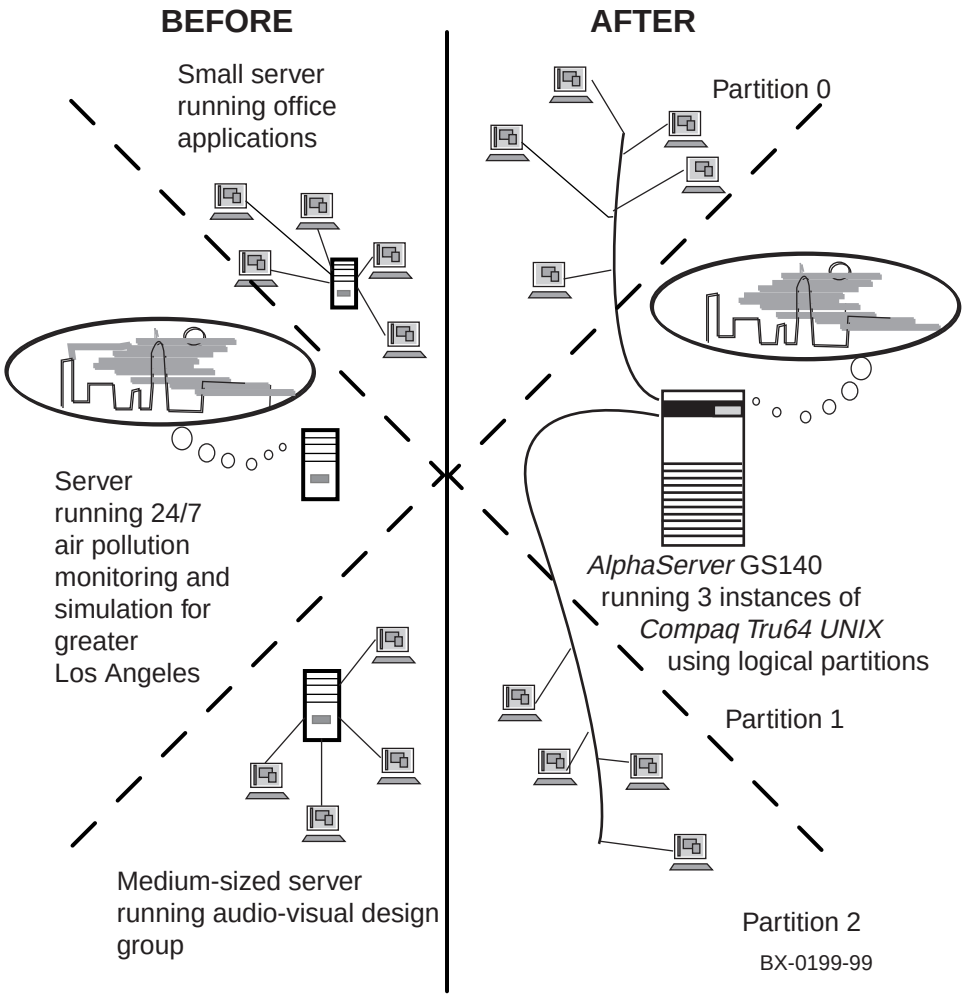
1.1 Reasons for Partitioning

Partitioning can be used for various reasons, including the consolidation of computing resources into one system or increasing the efficiency of an existing system.

Figure 1–2 Consolidating Resources by Using Partitioning



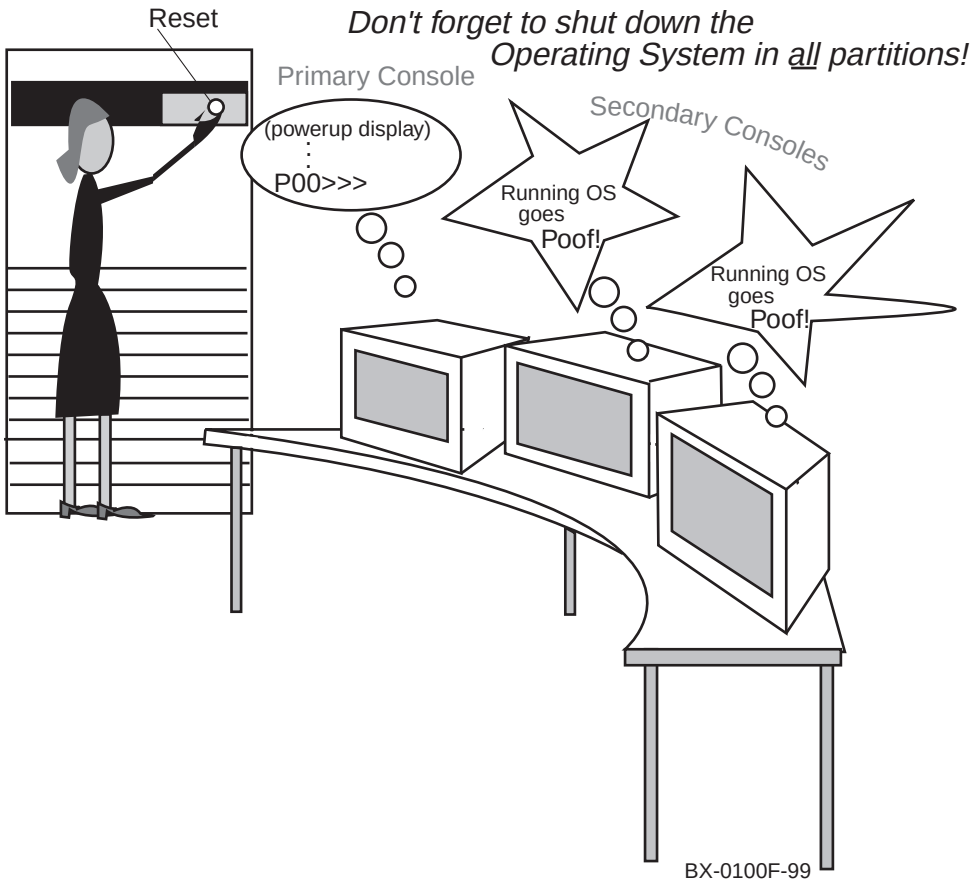
With logical partitioning, you can divide computing resources into as many as three distinct partitions. Partitioning can be used for a variety of reasons, including:

- Consolidation of several different computing requirements into one hardware system, thereby reducing floor space requirements, power consumption, and air conditioning costs. Figure 1–2 shows an example of how an enterprise whose computing needs are met by three different systems can accomplish the same work with one system (a GS140) using logical partitions. Logical partitions can be used to run different applications that require different configuration and tuning of the operating system.
- Increasing the efficiency of an existing system. For example, a facility may have one particularly I/O intensive (or compute intensive) application and a variety of other applications without such demands. With partitioning, you can allocate the resources needed to provide the two separate environments required. More I/O (or CPU) modules can be allocated to the I/O (or compute) intensive application and the other applications limited to a smaller set of resources, and both environments run at the same time.

1.2 Important Considerations for Partitioned Systems

Here are some important considerations for partitioned *AlphaServer* GS60E/GS140 systems.

Figure 1–3 Reset: Use Caution with Partitioned Systems



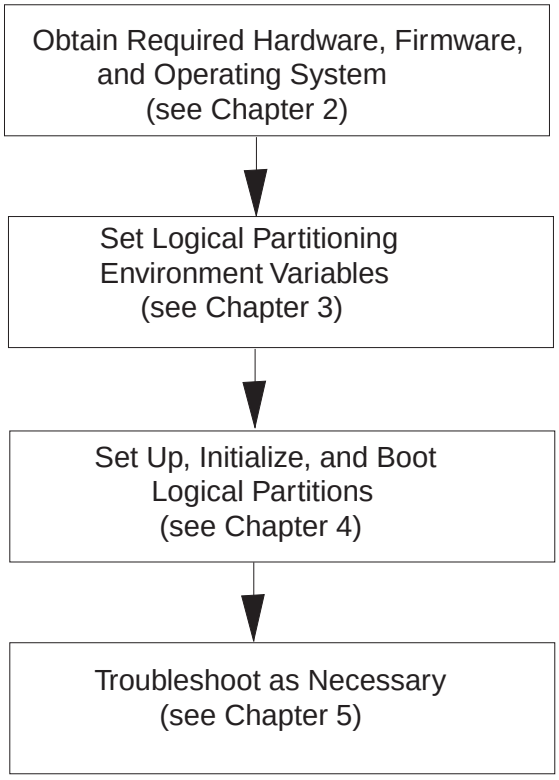
There are some important things to be aware of when running multiple instances of operating systems on separate partitions on *AlphaServer* GS60E/ GS140 systems:

- **Reset Keyswitch Position (GS140) or Reset Pushbutton (GS60E).** Once partitions are up and running separate instances of the operating system, turning the control panel keyswitch to the Reset position (GS140) or pushing the Reset pushbutton (GS60E) causes the system to initialize, stopping whatever is going on in all partitions. **To halt operations in an orderly manner, you must shut down the operating system for each of the partitions at the appropriate console terminal and then use Reset.**
- **Init Command**. Issuing the **init** command at the console terminal for *any* partition causes a complete reinitialization of *all* partitions defined for the system, with results as described for Reset, above. With the **init** command, however, the firmware displays a prompt asking you to confirm that you want to reset all partitions before any action is taken.
- **Ctrl/P.** At the primary console, you can halt a hung instance of the operating system by using the Ctrl/P keystroke, returning to the console prompt. Secondary partitions continue uninterrupted. Ctrl/P does not work from secondary consoles, but you can stop processing in secondary partitions by issuing a **stop *n*** command to halt a CPU from another partition, as discussed further in Chapter 5.

1.3 Overview of the Partitioning Process

To define logical partitions, you need to check the hardware configuration, assign modules to partitions as desired, initialize the partitions, and install the operating system.

Figure 1–4 Overview of Using Logical Partitions



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There are hardware, firmware, and software requirements and restrictions to meet before you can run logical partitions. Chapter 2 describes the major hardware configuration rules as of this printing. However, you should check the *Systems and Options Catalog* for the most up-to-date information on the hardware, firmware, and software required. The *Systems and Options Catalog* also lists hardware that is not supported for partitioned systems and must be removed from your system before partitions will run. The *Systems and Options Catalog* is available on the web at http://www.compaq.com/alphaserver/.

Defining logical partitions involves setting certain environment variables. Settings for these environment variables are discussed in Chapter 3.

A sequence of console commands must be issued to set environment variables and to initialize logical partitions before installation of an instance of the operating system in each partition. These commands are described in Chapter 4. See also the information on logical partitioning in the *Tru64 UNIX System Administrator's Guide* for information on how to initialize logical partitions and boot and install the operating system.

Once partitions are up and running separate instances of an operating system, maintenance and troubleshooting will likely be done from each partition's console terminal. For example, a hardware error may cause one instance of the operating system to crash. If the proper installations have been made, you can run DECevent from the problem partition to debug.

However, some conditions (such as upgrading your system's console firmware, or to include new modules or other hardware) require shutting down each instance of the operating system and disabling partitions temporarily until the situation is taken care of. This procedure is described in Chapter 5.

Chapter 2
Configuration Rules

To define logical partitions for *AlphaServer* GS60E/GS140 systems, you must have certain hardware. Other hardware normally supported on *AlphaServer* GS60E/GS140E systems are not supported with logical partitions. Check the *Systems and Options Catalog* for up-to-date information. This chapter describes the hardware requirements at the time this manual was printed. Sections include:

- Overview of Configuration Requirements
- Example of a Partitioned GS60E System
- Example of a Partitioned GS140 System
- Module Configuration
- Memory Allocation
- DWLPB PCI Card Cages and Hose Connections
- KFE72-DA Adapters and Attached Console Terminals
- CD-ROM Drives for Partitions
- Attaching Floppy Drives for Secondary Partitions (Optional)
- Moving One Floppy Drive Between Partitions (GS140 – Optional)

2.1 Overview of Configuration Requirements

Here are the minimum and maximum configurations for partitioned systems.

Table 2–1 Requirements for a Three-Partition System (GS140 Only)

	Partition 0		Partition 1		Partition 2	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**
CPU modules[1]	1	1	1	1	1	1
Memory module size	512 MB	4 GB	512 MB	4 GB	512 MB	4 GB
Memory modules	1	1	1	1	1	1
I/O modules	1	1	1	1	1	1
DWLPB	1	4	1	4	1	4
KFE72-EA	0	1	N/A	N/A	N/A	N/A
KFE72-DA	N/A	N/A	1	1	1	1
BA35x	1	See footnote[2]	1	See footnote[2]	1	See footnote[2]
Disk Drives	2	See footnote[3]	2	See footnote[3]	2	See footnote[3]
RRD4x CD-ROMs	1	N/A	0	1	0	1
Floppy[4]	0	1	N/A	N/A	N/A	N/A

[1] Logical partitions support KN7CG (GS140) processors only.
[2] As many as you need, based on the number of SCSI controllers.
[3] Depends on the number of StorageWorks shelves in your configuration.
[4] Only required to run utilities such as the RAID Configuration Utility (RCU). (You can move one floppy between partitions, if necessary, as described in Section 2.9.)

Table 2–1 lists the minimum requirements and maximum restrictions for three logical partitions; Table 2–2, for two partitions.

Table 2–2 Requirements for a Two-Partition System (GS140 or GS60E)

	Partition 0		Partition 1	
	Min	**Max**	**Min**	**Max**
CPU modules[1]	1	5[2] (for GS140) or 2[2] (for GS60E)	1	5[2] (for GS140) or 2[2] (for GS60E)
Memory module size	512 Mbyte	4 Gbyte	512 Mbyte	4 Gbyte
Memory modules[2]	1	5 (for GS140) or 2 (for GS60E)	1	5 (for GS140) or 2 (for GS60E)
I/O modules[2]	1	2	1	2
DWLPB[3]	1	8	1	8
KFE72-EA/LA	0	1	N/A	N/A
KFE72-DA	N/A	N/A	1	1
BA35x[4]	1	See footnote 4	1	See footnote 4
Disk Drives[5]	2	See footnote 5	2	See footnote 5
RRD4x CD-ROMs	1	N/A	1	N/A
Floppy[6]	0	1	N/A	N/A

[1] Logical partitions support KN7CG (GS60E/GS140) processors only.
[2] The total number of modules connected to the TLSB must not exceed 9 (CPU, I/O, and memory) for GS140 systems or 7 (CPU, I/O, and memory) for GS60E systems.
[3] Configuration depends on number of I/O hoses available.
[4] The maximum is as many as you need, based on the number of SCSI controllers.
[5] The maximum depends on the number of StorageWorks shelves in your configuration.
[6] Only required to run utilities such as the RAID Configuration Utility (RCU). (On GS140 systems, you can move one floppy between partitions, if necessary, as described in Section 2.9.)

2.2 Example of a Partitioned GS60E System

These illustrations give an overview of some of the interplay between the number of hardware modules, DWLPB adapters, KFE72-DA adapters, and KZPBA adapters that you will need to consider in configuring your *AlphaServer* GS60E system to run logical partitions.

Figure 2–1 Sample GS60E Configuration

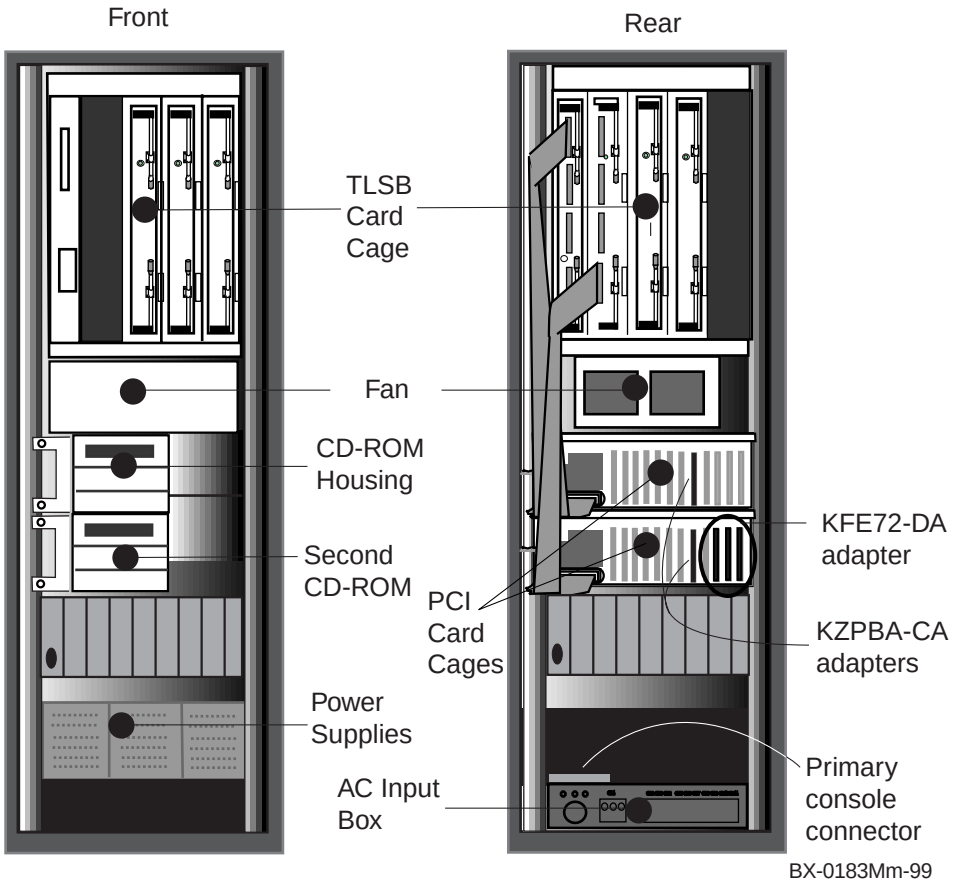


Figure 2–1 shows an example of an *AlphaServer* GS60E system with seven modules. The GS60E has seven slots, which will only allow for two logical partitions. Two I/O modules are present, each attached to a DWLPB.

One DWLPB is shipped with the system. This DWLPB must be connected to the I/O module in slot 8 of the TLSB. A second DWLPB with a KFE72-DA adapter is needed to support logical partitions, to provide the connection to the secondary console terminal. This DWLPB must be connected to any I/O module other than the one in slot 8.

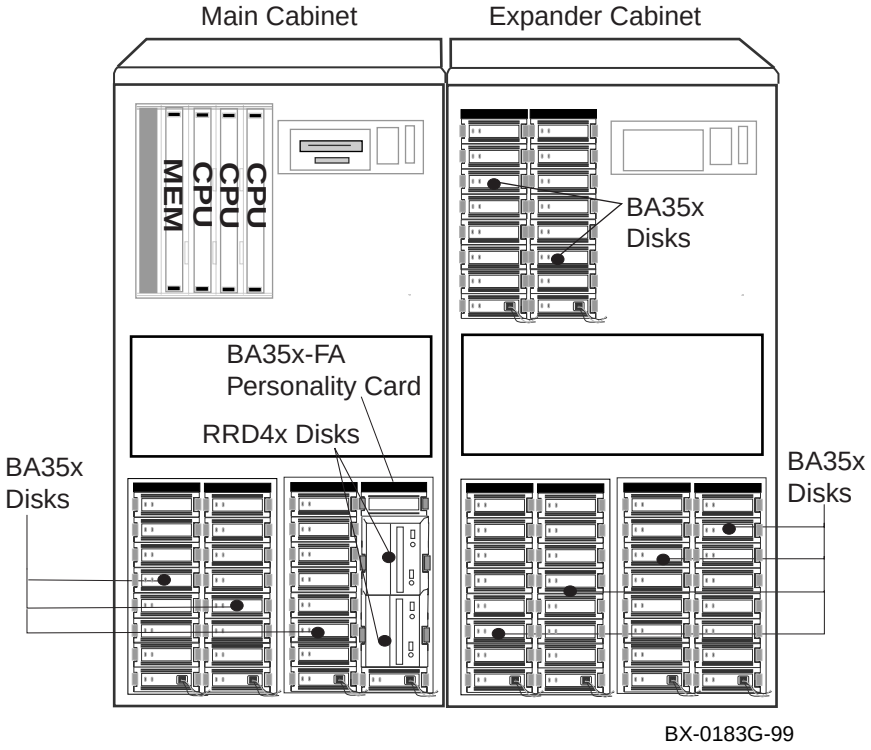
Two KZPBA-CA adapters are shown to support the two CD-ROM drives used as console load devices for the two partitions.

If you wish to have floppy drives available for one or both partitions, you must order two KFE72-LA adapters, one for each DWLPB.

2.3 Example of a Partitioned GS140 System

These illustrations give an overview of some of the interplay between the number of hardware modules, DWLPB adapters, KFE72-DA adapters, and disks that you will need to consider in configuring your *AlphaServer* GS140 system to run logical partitions.

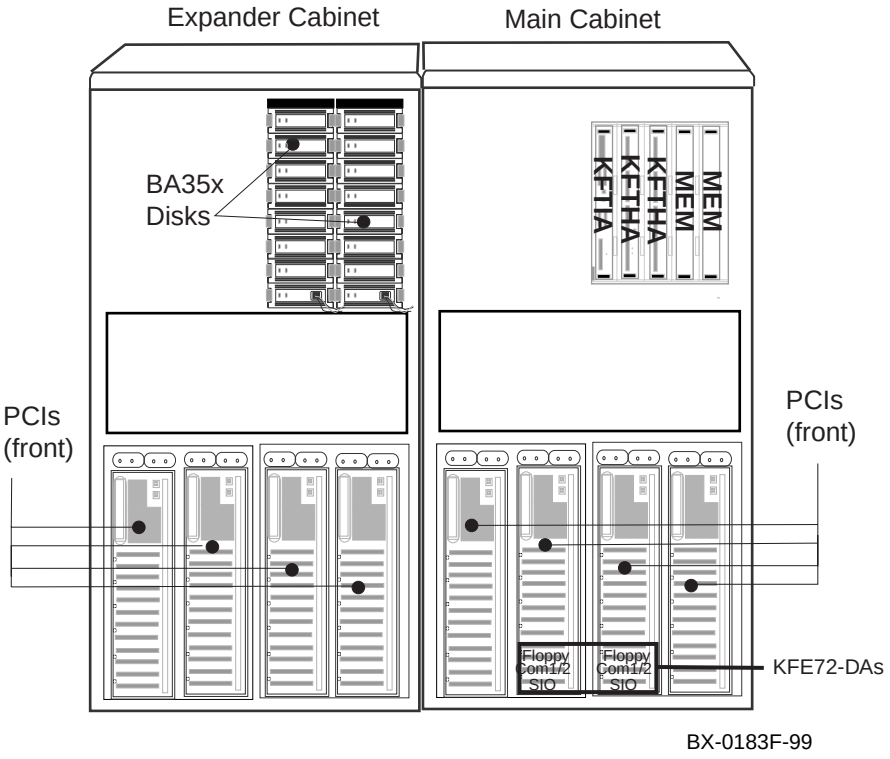
Figure 2–2 Sample GS140 Configuration (Front View of Cabs)



Figures 2–2 and 2–3 show an example of an *AlphaServer* GS140 system with nine modules. Three CPU modules, three memory modules, and three I/O modules would allow either 3 or 2 logical partitions, each running an instance of the operating system.

The KFE72-DAs needed to support logical partitions are present. Two CD-ROM drives are shown. Note that these CD-ROM drives protrude from the front of the shelf, and can only be installed in the rightmost shelf position in the front of either cabinet. In any other position, the drives will contact the crossbar support on the inside of the cabinet door and make it impossible to close.

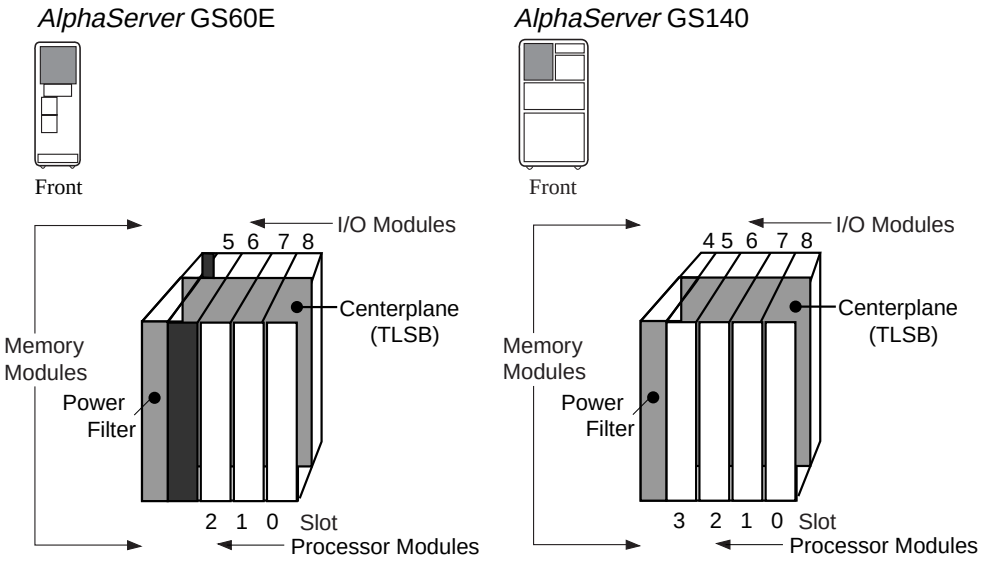
Figure 2–3 Sample GS140 Configuration (Rear View of Cabs)



2.4 Module Configuration

Partitions are constructed of a number of CPUs, memory, and I/O modules. Each partition must have at least one of each type.

Figure 2–4 Module Configuration



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Logical partitions are divided on hardware module boundaries. For example, each CPU module contains two CPUs, but you cannot have one CPU in one partition, and the other CPU in another. Both CPUs on a module must be in the same partition.

Each partition must have at least one CPU module, one memory module, and one KFTIA or KFTHA I/O module. The combined partitions may include up to nine modules (the limit of the TLSB card cage).

- CPU modules are installed beginning in slot 0 and proceed upward by slot number.
- I/O modules are installed beginning in slot 8 and proceed downward, to a limit of three I/O modules.
- Memory modules are installed beginning in the next-highest slot above the CPU module(s) and proceed upward until all modules are installed, up to slot 5 or 6 (depending on whether three or two I/O modules are installed, respectively).

Note that in a three-partition system, there can only be three CPU modules, three memory modules, and three I/O modules, since partitions allocate whole modules and the total number of slots available is 9. The memory modules can be of various sizes; disable interleaving for any configuration (**set interleave none**). Figure 2-4 shows the allowed configuration for modules in the TLSB card cage.

Allocating Modules to Partitions

Chapter 3 tells how you set console firmware environment variables to define which CPU and I/O modules are contained in any particular logical partition. You can allocate CPU modules and I/O modules to partitions in any configuration you desire, as long as each partition has at least one I/O module and one CPU module.

You specify memory mode for partitioning as **isolate**, which tells the console firmware to distribute memory modules between partitions at module boundaries. This is described in more detail in the next section.

2.5 Memory Allocation

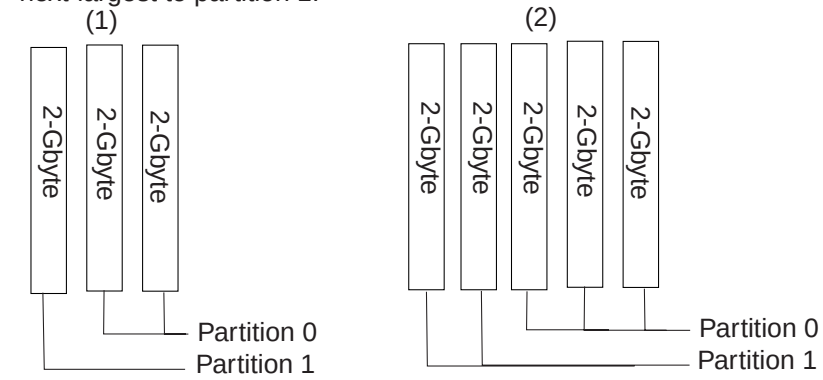
2.5.1 Two Partitions

The console firmware assigns memory to partitions such that an as-near-to-equal-as-possible amount of memory is given to each partition.

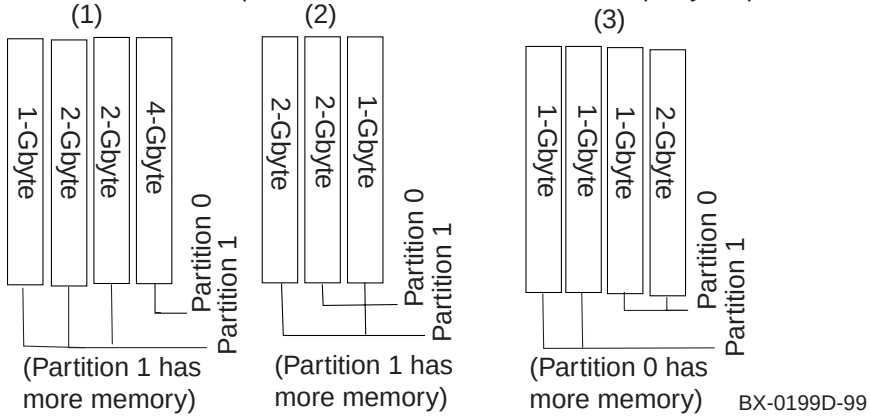
Figure 2–5 Memory Allocation with Two Partitions

A. Two (or four) memories of the same size: 1 (or 2) memories to each partition.

B. Three or five memories of same size: largest amount of memory to partition 0, next-largest to partition 1.



C. Two to five memories of varying size: largest module to partition 0, smallest module to partition 1, the rest allocated as equally as possible.



When you are defining two partitions, you may have from two to three memory modules (GS60E system) or from two to five memory modules (GS140 system), depending on the number of CPU and I/O modules in the system. Memory is always allocated on module boundaries. Set the **interleave** environment variable to **none**, as noted in Chapter 4.

The console firmware allocates the largest sized module to partition 0, and the smallest module to partition 1. It then attempts to distribute the remaining modules such that as equal an amount is given to both partitions as is possible.

Figure 2–5 shows some examples. Item A declares that when there are an even number of modules of equal size, the memory is divided equally. Item B illustrates an odd number of modules of equal size. Here, the distribution is as equal as possible, with the largest amount of memory going to partition 0, and the next-largest, to partition 1.

Item C shows some examples of a series of modules of varying size. In general, the largest memory module is allocated to partition 0, and the smallest, to partition 1. The remaining modules are divided so as to make the allocation for the two partitions as equal as possible. When a situation arises to make both partitions unequal with the same ratio, the firmware makes partition 0 the largest partition (case 3, below).

1. Here, the 4 -Gbyte memory is allocated to partition 0, and the 1-Gbyte memory is allocated to partition 1. There are two remaining 2-Gbyte modules, and they are distributed so as to make the partitions as equal as possible, giving both 2-Gbyte modules to partition 1, creating partition 0 with 4 Gbytes and partition 1 with 5 Gbytes.
2. Here, a 2-Gbyte memory is allocated to partition 0, and the 1-Gbyte memory is allocated to partition 1. The remaining 2-Gbyte memory is given to partition 1, since a 3-Gbyte/2-Gbyte allocation is more equal than allocating 4 Gbytes to partition 0 and 1 Gbyte to partition 1.
3. Here, a 2-Gbyte memory is allocated to partition 0, and a 1-Gbyte memory is allocated to partition 1. Either way the remaining 2-Gbyte memories are allocated (both to partition 1, or 1 to partition 0 and 1 to partition 1), the memory allocation will be 3 Gbytes/2 Gbytes, so the default is to make partition 0 the largest partition.

2.5.2 Three Partitions (GS140 Only)

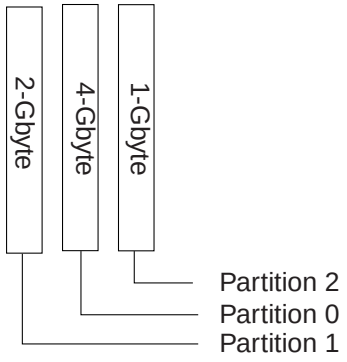
Three-partition systems require at least three memory modules. Each partition is allocated one module. Memory modules are allocated in decreasing size order.

Figure 2–6 Memory Assignment with Three Partitions

Three partitions, three memories:

A. Memories all the same size: 1 memory to each partition.

B. Memories of different size: largest memory to partition 0, next-largest to partition 1, smallest to partition 2.



BX-0199C-99

When you are defining three partitions, three memory modules are always needed. They may or may not be of the same size. Figure 2–6 shows some examples of how memory is divided in this case.

When all three memories are of the same size, one is allocated to each partition.

When the memories are of different size, the largest memory is assigned to partition 0; the next largest (or equal), to partition 1, and the next largest (or equal), to partition 2.

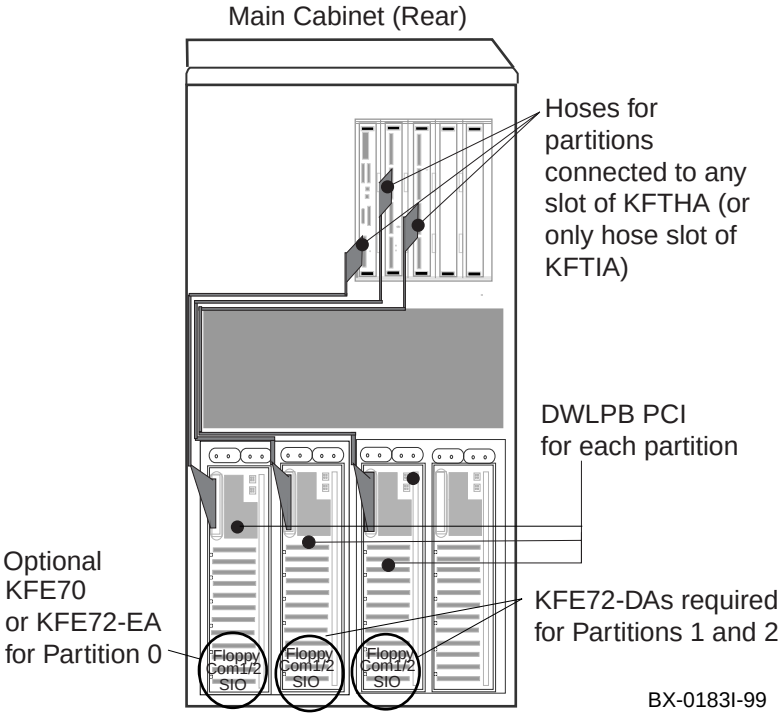
Again, set the **interleave** environment variable to **none**, as noted in Chapter 4.

2.6 DWLPB PCI Card Cages and Hose Connections

2.6.1 DWLPB Configuration for GS140 Systems

One DWLPB PCI card cage is required for each secondary partition on a GS140 system.

Figure 2–7 DWLPB PCI Card Cages for GS140 Systems



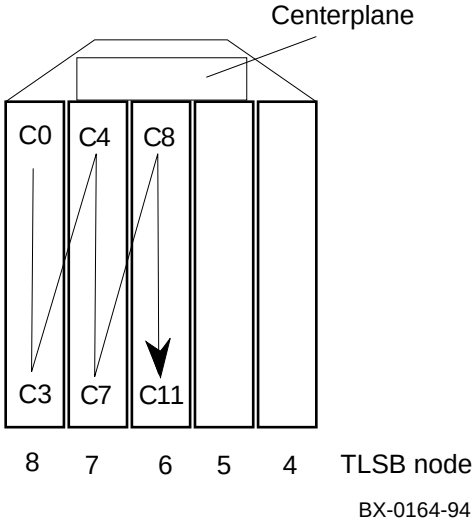
Each *AlphaServer* GS140 system may have a DWLPB PCI card cage with either a KFE70 adapter (standard I/O) or a KFE72-EA adapter (for graphics support) installed. This is only necessary if you wish to have the floppy drive installed near the front panel switches in the main cabinet. The I/O hose for this PCI must be connected to the I/O module in TLSB slot 8.

An additional DWLPB PCI card cage must be installed in the system for each secondary partition. These DWLPBs hold the KFE72-DA adapters needed for the additional serial console terminals for secondary partitions.

Figure 2–7 shows three DWLPBs, one with a KFE70. If used, the KFE70 must be in a DWLPB connected to the I/O module in slot 8 of the TLSB bus, as shown. The two other DWLPBs with KFE72-DAs for secondary partitions may be connected to any hose on any I/O module assigned to the partition. See Figure 2–8 for hose numbers for the various I/O slots.

The *DWLPA/DWLPB PCI PIU Installation Guide* tells how to install DWLPB PCI card cages.

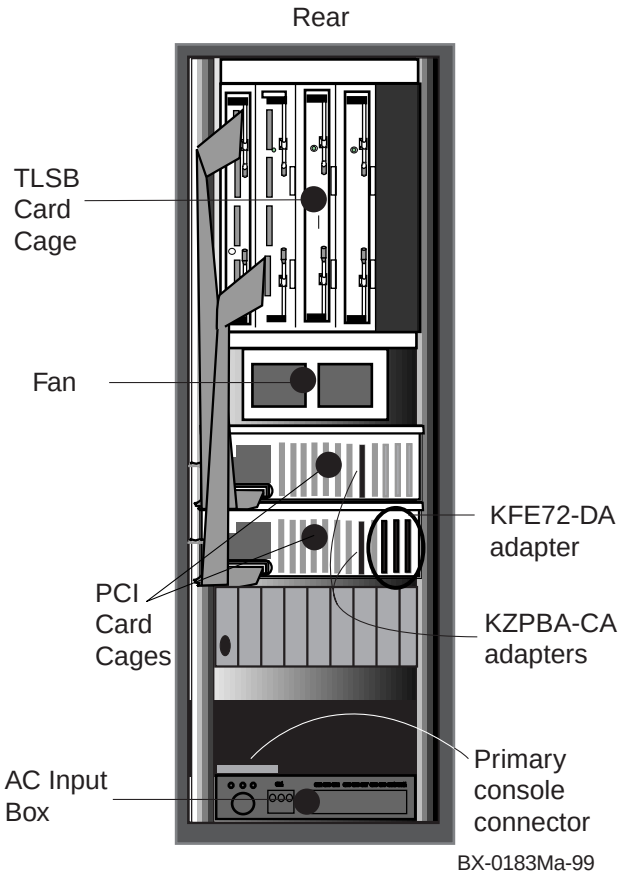
Figure 2–8 Hose Numbering Scheme for I/O Modules



2.6.2 DWLPB Configuration for GS60E Systems

Two DWLPB PCI card cages are required for GS60E systems to support logical partitions.

Figure 2–9 DWLPB PCI Card Cages for GS60E Systems



Each *AlphaServer* GS60E system comes with one DWLPB PCI card cage. The I/O hose for this PCI must be connected to the I/O module in TLSB slot 8.

An additional DWLPB PCI card cage must be installed in the system for the secondary partition. This DWLPB holds the KFE72-DA adapter needed for the additional serial console terminal for the secondary partition.

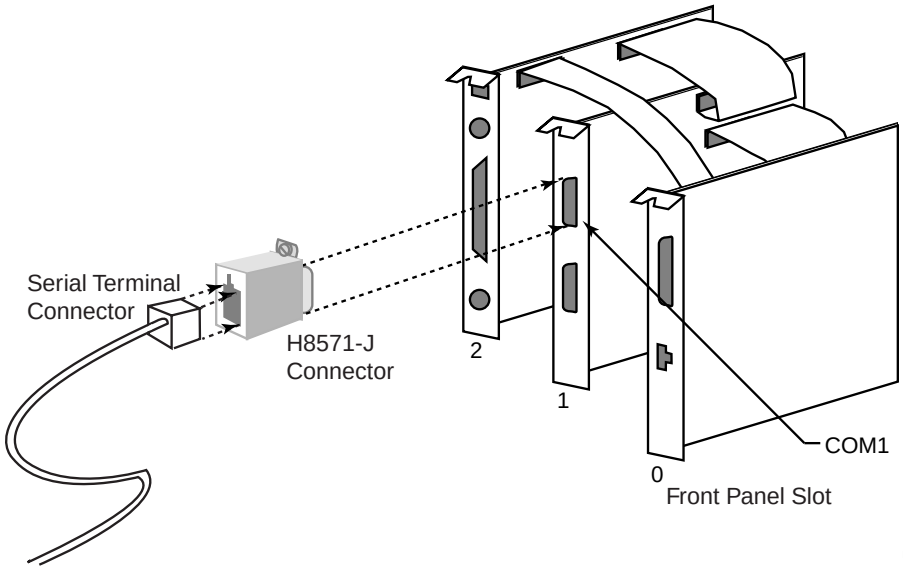
Figure 2–9 shows two DWLPBs, one with a KFE72-DA adapter. The DWLPB for the primary partition must be connected to the I/O module in slot 8 of the TLSB bus, as shown. The other DWLPB, with a KFE72-DA for a secondary partition, may be connected to any hose on another I/O module assigned to the partition. See Figure 2–8 for hose numbers for the various I/O slots.

The *DWLPA/DWLPB PCI PIU Installation Guide* tells how to install DWLPB PCI card cages.

2.7 KFE72-DA Adapters and Attached Console Terminals

One KFE72-DA adapter is required for each logical partition beyond partition 0. The KFE72-DA provides the port to connect an additional serial console terminal.

Figure 2–10 KFE72-DA Adapters



On GS60E systems, the connection for the *primary console terminal* is located at the rear of the system, above the AC power input box on the left side. On GS140 systems, the connection for the primary console terminal is on the control panel of the GS140. You may also have a KFE70 or KFE72-EA adapter connected to the TLSB in slot 8 to provide floppy support on the GS140, or a KFE72-LA adapter to provide floppy support on the GS60E. This is optional, however.

On both the GS60E and GS140, you must also have one KFE72-DA adapter for each secondary partition, installed in a separate DWLPB PCI card cage. The KFE72-DA adapter consists of three modules installed in slots 0, 1, and 2 of the PCI card cage. See the *KFE72 Installation Guide* (EK-KFE72-IN) for instructions on how to install all variants of KFE72 adapters.

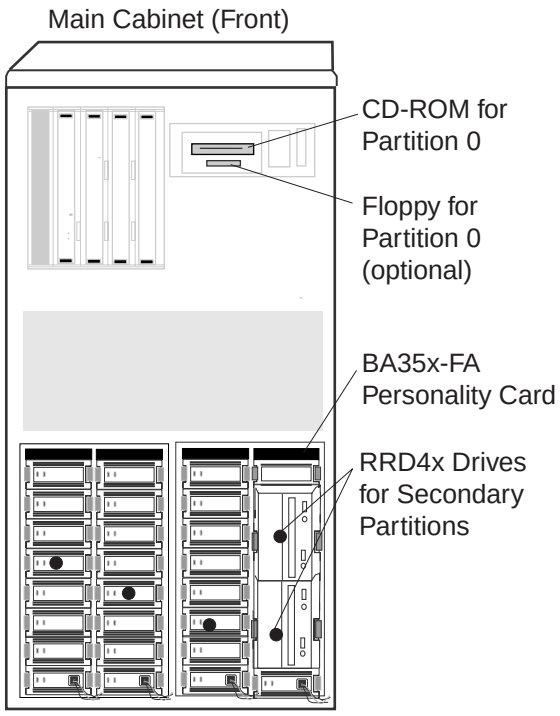
The console terminals for secondary partitions on the GS140 and the GS60E are connected to the COM1 port of each KFE72 adapter, in slot 1 of the PCI card cage, as shown in Figure 2–10.

The primary and secondary console devices can be character-cell video terminals or serial line connections to another system or terminal concentrator. Supported graphics devices can be used by the operating system's windowing software on any partition.

2.8 CD-ROM Drives for Partitions

On a GS140 system, the CD-ROM drive for partition 0 is located near the control panel on the front of the machine. You may install RRD43/44/45/46/47-VA CD-ROM drives for each secondary partition in the rightmost shelf at the front of either the main cabinet or the expander cabinet. On a GS60E system, the CD-ROM drive for partition 0 is located at the front of the system below the fan. You can install a second CD-ROM drive for the secondary partition below the first one.

Figure 2–11 Placement of RRD4x-VA Drives on a GS140 System

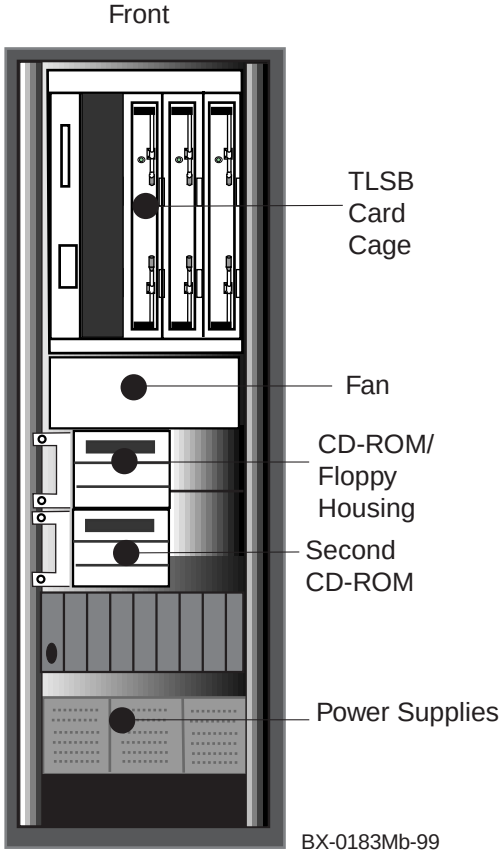


For a GS140 system, you can install one RRD46/47-VA CD-ROM drive for each secondary partition in your system, if, for example, you have no network adapter or installation server available and want to boot from a CD-ROM in each partition.

For a GS140, if you put these disks in the main or expander cabinets, they *must* occupy the rightmost shelf at the front of the cabinet. They protrude from the shelf, and the front door will not close if they are in other shelves.

For a GS60E system, you can install a KZPBA-CA adapter and a second CD-ROM drive (part number 3X-RRDRX-AA) for the secondary partition in your system.

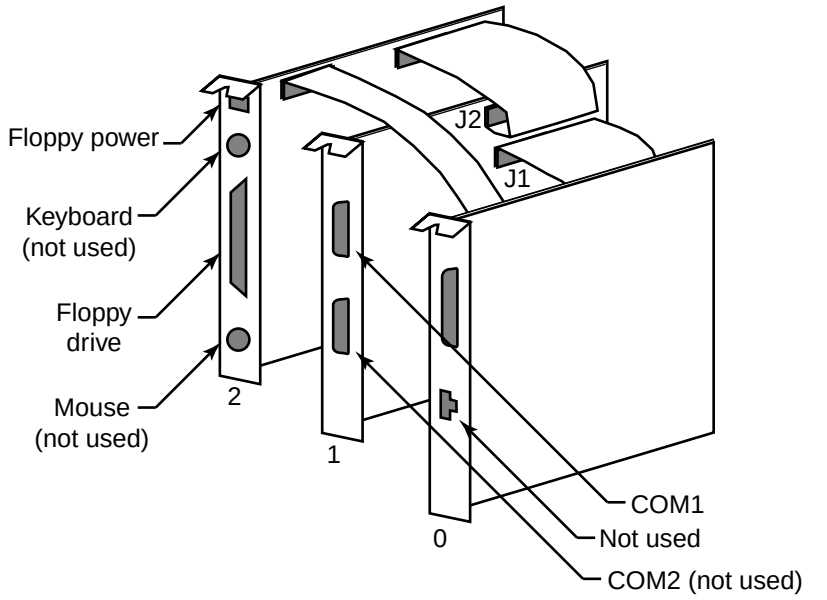
Figure 2–12 CD-ROM Drives in a GS60E System



2.9 Attaching Floppy Drives for Secondary Partitions (Optional)

You may wish to install floppy drives on your KFE72-DA adapters on GS140 systems. To include floppy drives on your GS60E system, you need a KFE72-LA adapter for each partition for which you wish to add floppy support. (The KFE72-LA would replace the KFE72-DA in the secondary partition.)

Figure 2–13 Floppy Drive Connector on KFE72-DA Adapter



On GS140 systems you may install a floppy drive off of the floppy drive port on the connector module of the KFE72-DA (in front panel slot 2 of the PCI card cage), as shown in Figure 2–13.

If you only have one floppy drive on your GS140 system, and wish to move it between partitions, see Section 2.10.

To include floppy drives on your GS60E system, you need a KFE72-LA adapter for each partition for which you wish to add floppy support. (The KFE72-LA would replace the KFE72-DA in the secondary partition.)

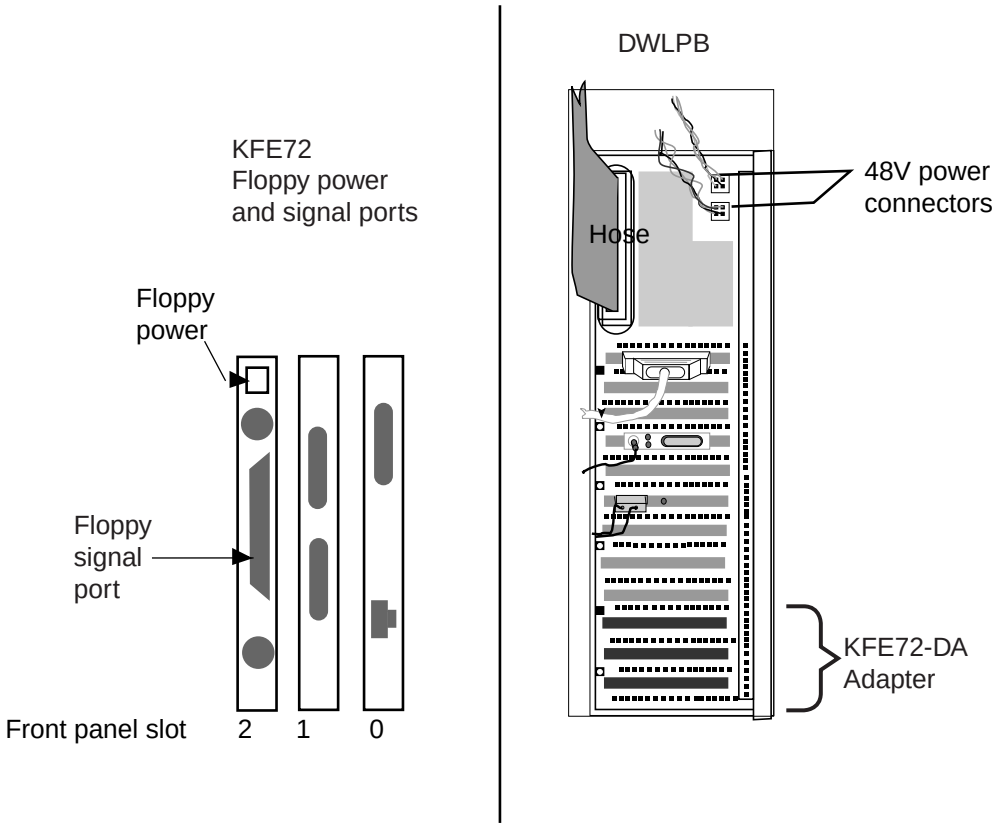
You can only use one floppy drive at a time when running utilities such as RCU, even if you have two on your system. If you have two floppy drives installed on either a GS140 or GS60E system and wish to use one, you must first remove power from the DWLPB to which the other floppy is connected. Unplug the 48V power input cable to the DWLPB, next to the hose connection on the DWLPB. (See Figure 2–14 for the location for a DWLPB on a GS140; the orientation for the GS60E would be as shown in Figure 2–14, rotated 90° to the right). Note that both DWLPBs can be connected while you are running the operating system.

2.10 Moving One Floppy Drive Between Partitions (GS140 Only – Optional)

This section tells how to move a single floppy from one partition to another on GS140 systems, to run RCU for each partition, for example, when you have only one floppy drive in your configuration.

2.10.1 Moving a Floppy Drive on a GS140 System

Figure 2–14 Relevant Connectors on KFE72s and DWLPBs for the GS140



If you need to run configuration utilities from various partitions, and have only one floppy drive, you can attach it to separate partitions as follows:

1. Shut down the operating system instances in each partition.
2. Disable partitions and reinitialize the system to a nonpartitioned state, as described in Section 5.3. You may wish to record the environment variable information and use it when you re-enable partitions.
3. Power the system down.
4. Disconnect the floppy power and signal cables from the KFE70 or KFE72-EA on partition 0 and reattach them to the KFE72-DA that resides on the KFTIA or KFTHA of the partition you want to configure. See the left side of Figure 2–14 for the location of these power and signal cables.
5. Remove power from any other DWLPB that contains a KFE72 (see the right side of Figure 2–14).
6. Power up the system.
7. Run the desired utilities, inserting the floppy and running it from the floppy drive you just moved.
8. Power the system down.
9. Reconnect 48V to any DWLPB that you removed in step 5.
10. Move floppy drive to whichever partition you want it on.
11. Power up the system.
12. Initialize the partitions. If you need to make any changes to partition-specific environment variables, make sure the primary partition and secondary partition's **auto_action** environment variable is set to **halt** so that you can make these changes from each console terminal.

Chapter 3
Environment Variables that Create Logical Partitions

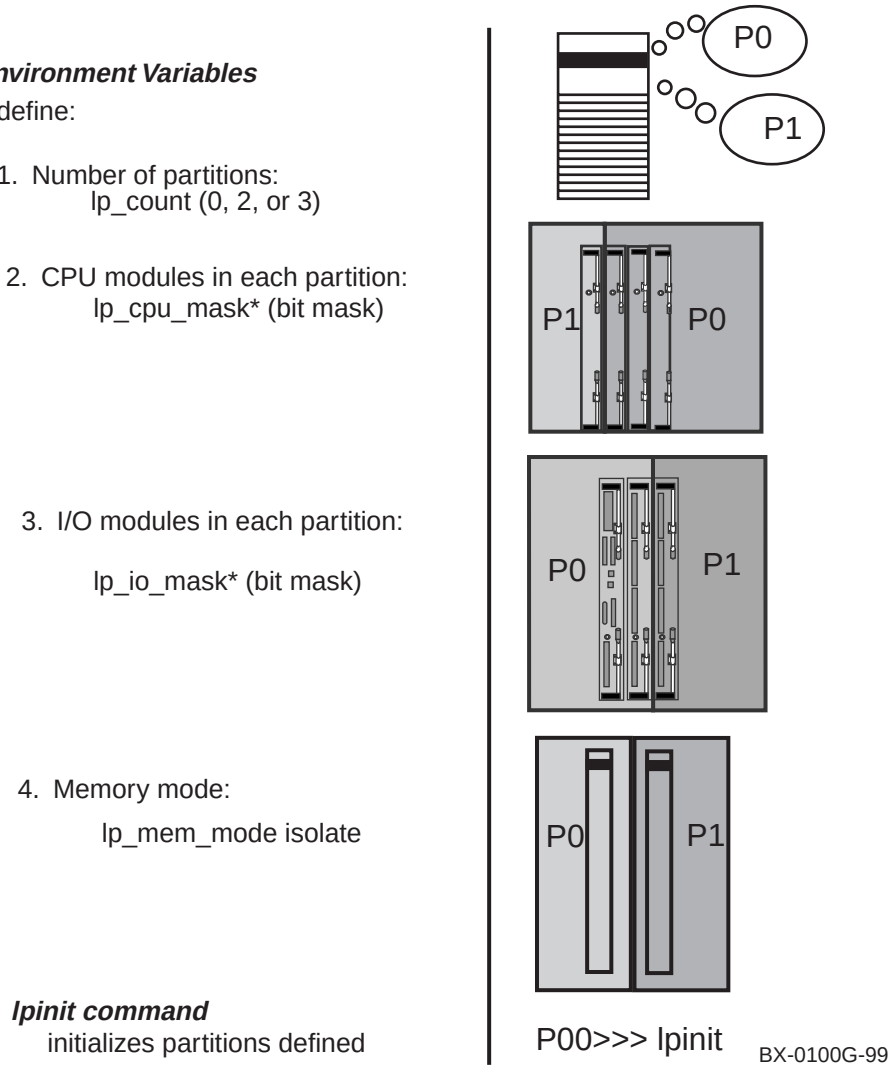
You define what resources are allocated to each partition by creating or setting environment variables. Before showing the sequence of these commands (see Chapter 4), you should understand in detail the significance of these environment variables and their settings, as described in this chapter. Sections include:

- Environment Variables Used
- Detailed Directions for lp_cpu_mask
- Detailed Instructions for lp_io_mask

3.1 Environment Variables Used

Four environment variables and the lpinit command define partitions.

Figure 3–1 Environment Variables and lpinit Command



You define values for one environment variable to define the number of logical partitions on your system, one to set the memory mode, and two for each partition that define the CPU and I/O modules in each partition. The **lpinit** command (described in context in Chapter 4) initializes the logical partitions defined. Figure 3–1 and Table 3–1 give an overview of the environment variables and what they do. Environment variable settings for the CPU and I/O masks are discussed in detail in following sections of this chapter. (Memory allocation is discussed in detail in Section 2.5.)

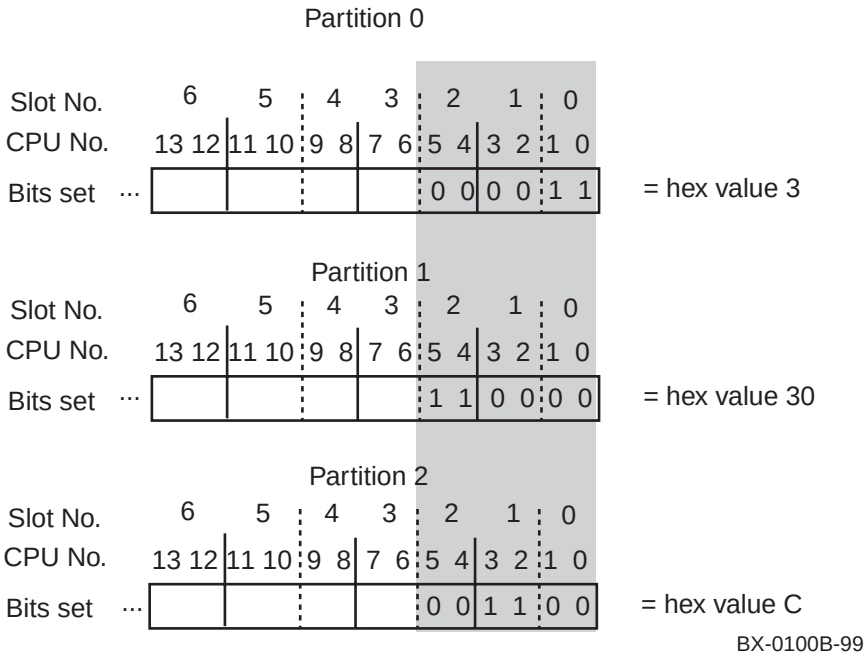
Table 3–1 Environment Variables for Logical Partitions

Environment Variable	Definition
lp_count *n*	The number of logical partitions you wish to create on the system. At the start of creating logical partitions, you set this value to 0. Later, as described in Chapter 4, you define the number of logical partitions desired. 0 indicates the traditional symmetric multiprocessing system. Possible values are 0 (partitions disabled), 2 (for two partitions), or 3 (for three partitions, allowable only on GS140 systems).
lp_cpu_mask* *x*	For the *, you supply the number of the partition, which may be 0, 1, or 2. (The value 2 is only possible with GS140 systems.) The value *x* gives a binary mask indicating which CPUs you want included as part of the instance. Although the mask selects individual CPUs, assignments must align with module boundaries. See Section 3.2 for detailed examples.
lp_io_mask* ***x***	For the *, you supply the number of the partition, which may be 0, 1, or 2. (The value 2 is only possible with GS140 systems.) The value *x* gives a binary mask indicating the slot number of the I/O module or modules to be reserved for the use of a particular instance. Detailed examples are given in Section 3.3.
lp_mem_mode *x*	The value of *x* must be **isolate**.

3.2 Detailed Directions for lp_cpu_mask

The lp_cpu_mask environment variable is set to a value that creates a binary mask in which a bit set to 1 indicates that an individual CPU belongs to a partition. Recall that there are two CPUs per module, and that partitions must contain whole modules.

Figure 3–2 Construction of Three-Partition CPU Bit Mask (GS140 Only)



Note that you must assign CPUs to a partition on module boundaries. CPU modules can be assigned to partitions in any order.

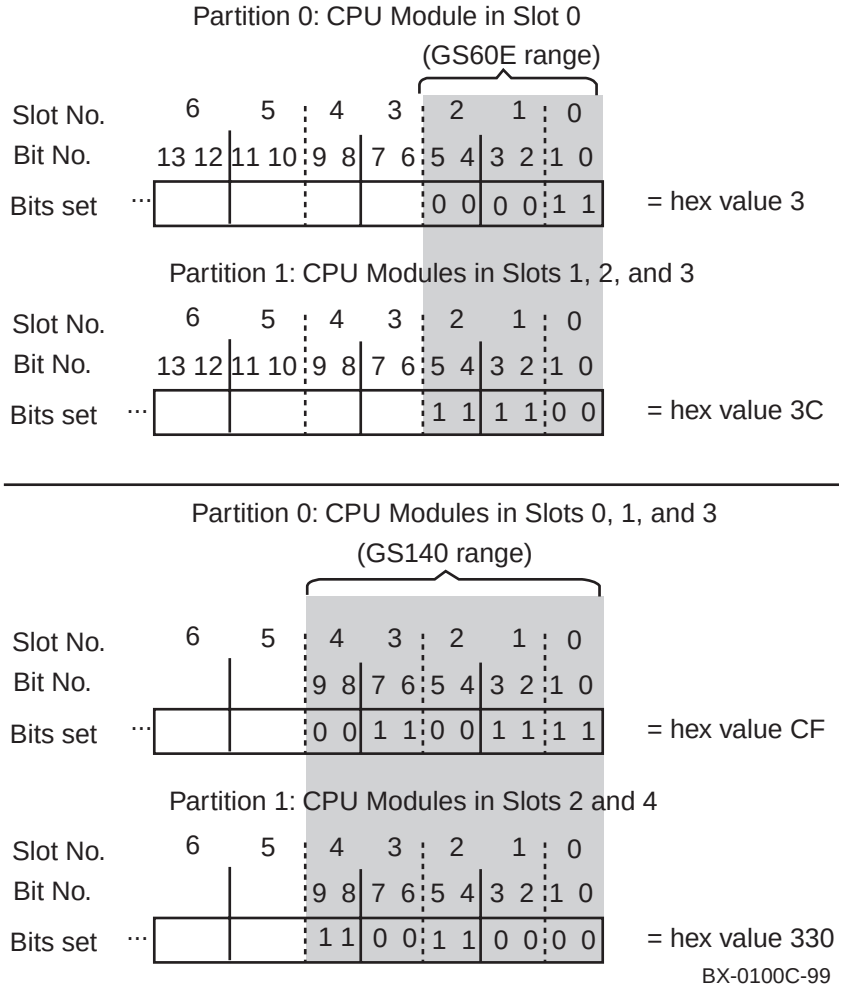
Three-Partition System

For a three-partition system, three CPU modules is the maximum allowed (since there must also be three memories and three I/O modules, and the total number of slots is 9.) In this case, assigning CPUs to partitions is fairly straightforward. Again, the CPUs in slot 0 must be assigned to partition 0. The CPUs in slots 1 and 2 can be assigned as desired. Figure 3–2 shows the construction of a bit mask for three partitions, with the CPUs in slot 0 assigned to partition 0, the CPUs in slot 2 assigned to partition 1, and the CPUs in slot 1 assigned to partition 2. You would use the console commands:

```
P00>>> create –nv lp_cpu_mask0 3
P00>>> create –nv lp_cpu_mask2 30
P00>>> create –nv lp_cpu_mask1 C
```

NOTE: *Once the desired environment variables have been created with* ***create –nv****, you can set them to different values with the* ***set*** *command.*

Figure 3–3 Construction of Two-Partition CPU Bit Masks



Two-Partition System (GS60E or GS140)

A two-partition system has more possibilities for CPU allocation. For GS140 systems, from two to five slots may be occupied by CPU modules in TLSB slots 0 – 4. For GS60E systems, two to three slots may be occupied by CPU modules in TLSB slots 0 – 2. Again, the CPUs in slot 0 must be assigned to partition 0. Other than that, there are no restrictions.

The top portion of Figure 3–3 shows an allocation for a GS60E system with three CPU modules in slots 0, 1, and 2. The CPUs in slot 0 are included in partition 0, and the CPUs in slots 1 and 2 are included in partition 1. The console commands used to create the appropriate masks are:

```
P00>>> create –nv lp_cpu_mask0 3
P00>>> create –nv lp_cpu_mask1 3c
```

The bottom portion of Figure 3–3 shows an allocation for a GS140 system with five CPU modules in slots 0, 1, 2, 3, and 4. The CPUs in slots 0, 1, and 3 are included in partition 0, and the CPUs in slots 2 and 4 are included in partition 1. You would use the following console commands to create such an allocation:

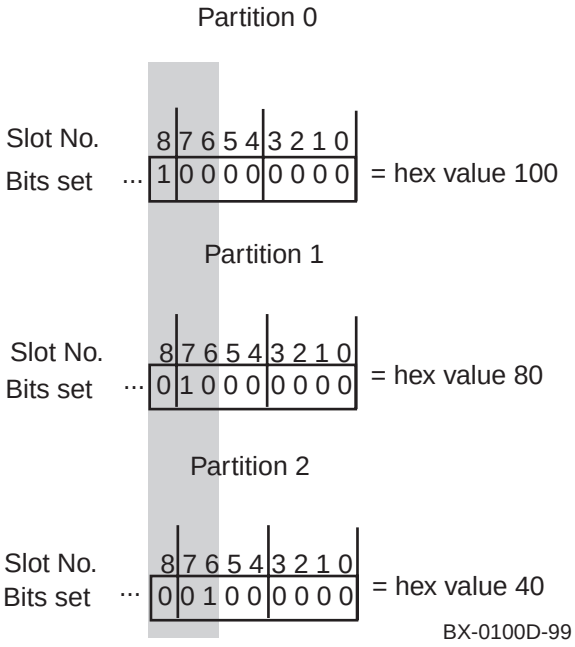
```
P00>>> create –nv lp_cpu_mask0 cf
P00>>> create –nv lp_cpu_mask1 330
```

NOTE: *Once the desired environment variables have been created with* ***create –nv****, you can change their values with the* ***set*** *command.*

3.3 Detailed Instructions for lp_io_mask

The lp_io_mask environment variable is set to a hexadecimal mask in which the bit position of a 1 indicates the slot in which the I/O module resides.

Figure 3–4 Construction of Three-Partition I/O Bit Masks (GS140 Only)



A three-partition system requires three I/O modules (either one KFTIA plus two KFTHA modules, or three KFTHA modules), one module for each partition. Figure 3–4 shows the bit locations for assigning the I/O module in slot 8 to partition 0, the I/O module in slot 7 to partition 1, and the I/O module in slot 6 to partition 2. The console commands issued to create such partitioning are:

```
create –nv lp_io_mask0 100
create –nv lp_io_mask1 80
create –nv lp_io_mask2 40
```

Two-partition systems may have two or three I/O modules.

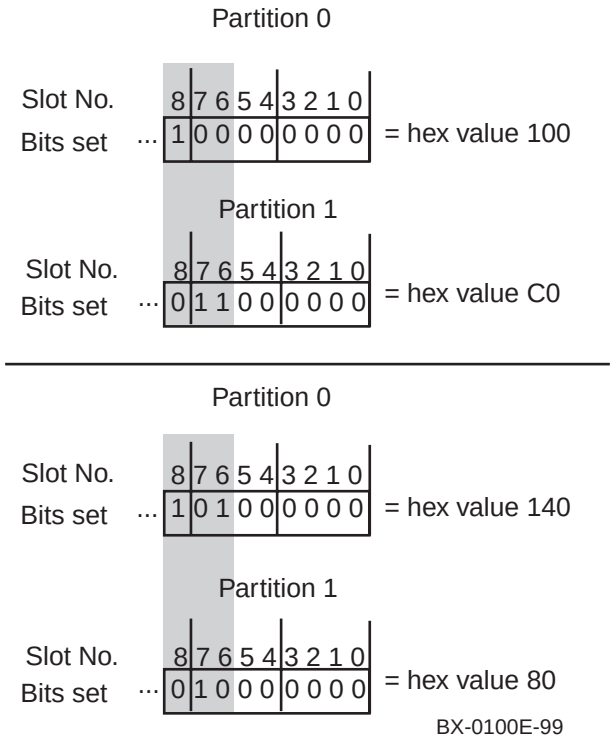
Figure 3–5 gives two examples of three-I/O-module, two-partition systems. The first shows partition 0 with one I/O module in slot 8, and partition 1 with two modules in slots 6 and 7. The console commands are:

```
create –nv lp_io_mask0 100
create –nv lp_io_mask1 c0
```

The bottom of Figure 3–5 shows a two-partition system with the I/O modules in slots 8 and 6 assigned to partition 0, and the I/O module in slot 7 assigned to partition 1. The console commands used to create such partitioning are:

```
create –nv lp_io_mask0 140
create –nv lp_io_mask1 80
```

Figure 3–5 Construction of Two-Partition I/O Bit Masks



Chapter 4
Setting Up, Initializing, and Booting Logical Partitions

The sequence of console commands used to define and initialize partitions is described in this chapter. Sections include:

- Primary Console: Check Configuration
- Step 1: Create and Initialize Environment Variables from the Primary Console
- Step 2: Initialize Partitions from the Primary Console; Boot/Install OS in Partition 0
- Step 3: Set and Initialize Environment Variables, Boot from Secondary Consoles

4.1 Primary Console: Check Configuration

Before you define any partitions, check to make sure you have all you need to support partitions as you wish to configure them.

Example 4–1 Check Configuration from Primary Console

```
ff.fe.fd.fc.fb.fa.f9.f8.f7.f6.f5.f3.f2.f1.f0.    ❶
 ef.ee.ed.f4.
20.21.22.23.24.25.26.27.a2.a4.a5.a7.a8.a9.ec.eb.ea.e9.e8.e7.e6.e5.e3.

 F   E   D   C   B   A   9   8   7   6   5   4   3   2   1   0   NODE #
                             A   A   A   M   M   M   P   P   P   TYP❷
                             o   o   o   +   +   +  ++  ++  ++   ST1
                             .   .   .   .   .   .  EE  EE  EB   BPD
                             o   o   o   +   +   +  ++  ++  ++   ST2
                             .   .   .   .   .   .  EE  EE  EB   BPD
                             +   +   +   +   +   +  ++  ++  ++   ST3
                             .   .   .   .   .   .  EE  EE  EB   BPD
                                 .   +   +   +   .   +   +   +   C0 PCI +  ❸
                 +   +   .   +   +   .   .   .   .   .   .   .   C1 PCI +
.                                    .   .   .   .   .   .   .      EISA +
                 .   .   .   +   +   +   +   .   +   .   .   +   C4 PCI +  ❹
                                 .   .   .   .   .   .   .   .      EISA +
 .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C5
 .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C6
 .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C7

                 +   +   +   +   +   +   .   .   +   .   .   +   C8 PCI +  ❺
                                 .   .   .   .   .   .   .   .      EISA +
 .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C9
 .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C10
 .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C11

                             .   .   .  C0  B0  A0   .   .   .   ILV  ❻
                             .   .   . 1GB 1GB 1GB   .   .   .   3GB
 Compaq AlphaServer GS140 6-6/525/4, Console V5.4-18 30-APR-1999 16:24:17  ❼
 SROM V2.1, OpenVMS PALcode V1.53-5, Tru64 UNIX PALcode V1.48-4
 System Serial = qv, OS = Tru64 UNIX, 21:20:07  March 15, 1999
 Configuring Graphics
 Configuring I/O adapters...
 isp0, slot 0, bus 0, hose0
   .
   .
   .
[configuration display continues]
```

[*Continued on following page*]

From the primary console terminal, check the configuration. You can do this either from the power-up display (see Example 4–1 for a GS140 display) or by using a **show config** command.

❶ The *AlphaServer* GS60E/GS140 power-up display includes (as long as a CPU module is in slot 0) test numbers as testing proceeds, so that if the system fails, the user or field service engineer can determine the point during testing that the system failed.

❷ The TYP line of the power-up display shows three CPUs, three memories, and three I/O modules, so the TLSB hardware supports three partitions.

❸, ❹, and ❺ A DWLPB (PCI) is installed in hose 1 (C1) of the KFTIA in slot 8, and in the topmost hoses (C4 and C8) of the KFTHAs in slots 7 and 6 respectively.

❻ Three separate interleave sets (A, B, and C) are shown, which indicates the **interleave** environment variable is set to **none**.

❼ Check the version of the console firmware to make sure it supports logical partitions. (See the *Systems and Options Catalog* for information on the version of the firmware supporting logical partitions.)

Example 4–1 Check Configuration from Primary Console (Continued)

```
P00>>> sho config   ❶

        Name                    Type   Rev  Mnemonic
   TLSB
   0++   KN7CG-AB               8025  0000  kn7cg-ab0      ❷
   1++   KN7CG-AB               8025  0000  kn7cg-ab1
   2++   KN7CG-AB               8025  0000  kn7cg-ab2
   3+    MS7CC                  5000  0B04  ms7cc0
   4+    MS7CC                  5000  0000  ms7cc1
   5+    MS7CC                  5000  0000  ms7cc2
   6+    KFTHA                  2000  0D03  kftha1
   7+    KFTHA                  2000  00D3  kftha0
   8+    KFTIA                  2020  0000  kftia0

   C0 Internal PCI connected to kftia0     pci0
   0+    QLogic ISP1020    10201077  0001  isp0
   1+    QLogic ISP1020    10201077  0001  isp1
   2+    DECchip 21040-AA     21011  0024  tulip0
   4+    QLogic ISP1020    10201077  0001  isp2
   5+    QLogic ISP1020    10201077  0001  isp3
   6+    DECchip 21040-AA     21011  0024  tulip1

   C1 PCI connected to kftia0              pci1

   0+    SIO                4828086  0015  sio0
   3+    VGA                  D1011  0022  vga0

Controllers on SIO                   sio0
   0+    DECchip 21040-AA     21011  0024  tulip2         ❸
   1+    FLOPPY                   2  0000  floppy0
   2+    KBD                      3  0000  kbd0
   3+    MOUSE                    4  0000  mouse0

     EISA connected to pci2 through sio0   eisa0

   C4 PCI connected to kftha0              pci2
   0+    SIO                4828086  0015  sio1
   7+    QLogic ISP1040B   10201077  0005  isp4
   8+    DECchip 21140-AA     91011  0022  tulip4
   A+    QLogic ISP1040B   10201077  0005  isp5
   B+    KZPSA                81011  0000  kzpsa0

     Controllers on SIO                    sio1   ❸
   0+    DECchip 21040-AA     21011  0024  tulip3
   1+    FLOPPY                   2  0000  floppy1
   2+    KBD                      3  0000  kbd1
   3+    MOUSE                    4  0000  mouse1
   6+    TOY                      7  0000  toy1

     EISA connected to pci2 through sio1   eisa1
```

Example 4–1 Check Configuration from Primary Console (Continued)

```
C8 PCI connected to kftha1              pci3
0+    SIO                4828086  0015  sio2
3+    VGA                  D1011  0022  vga1
6+    QLogic ISP1040B   10201077  0005  isp6
7+    QLogic ISP1040B   10201077  0005  isp7
8+    DECchip 21041-AA    141011  0021  tulip6
9+    DECchip 21140-AA     91011  0022  tulip7
A+    KZPSA                81011  0000  kzpsa1
B+    Mylex DAC960         11069  0002  dac3

  Controllers on SIO                    sio2     ❸
0+    DECchip 21040-AA     21011  0024  tulip5
1+    FLOPPY                   2  0000  floppy2
2+    KBD                      3  0000  kbd2
3+    MOUSE                    4  0000  mouse2
6+    TOY                      7  0000  toy2

  EISA connected to pci3 through sio2   eisa2
```

Use the **show config** command to ensure that the correct CPU modules are present and that there are sufficient DWLPB PCI card cages with KFE72-DA adapters for the desired number of partitions.

❶ After power-up completes, issue the **show config** command from the console prompt.

❷ The processors are KN7CG processors.

❸ Ensure that there are enough PCI card cages with KFE72-EA/LA and KFE72-DA adapters attached. Note that the listing for the C1 hose attached to the KFTIA has a VGA monitor card, indicating that this is a KFE72-EA. (On a GS60E, this would be a KFE72-LA.) The SIO listings for the DWLPBs connected to slots 7 and 6 show modules consistent with KFE72-DAs.

4.2 Step 1: Create and Initialize Environment Variables from the Primary Console

Create (or set) a series of environment variables from the primary console terminal.

Example 4–2 Initial Commands from the Primary Console

```
P00>>> show version
version     V5.4-18, 30 APR-1999 16:24:17  ❶
P00>>> show lp*  ❷
P00>>>
P00>>> create -nv lp_count 3   ❸
P00>>> create -nv lp_cpu_mask0 3
P00>>> create -nv lp_cpu_mask1 c
P00>>> create -nv lp_cpu_mask2 30
P00>>> create -nv lp_io_mask0 100
P00>>> create -nv lp_io_mask1 80
P00>>> create -nv lp_io_mask2 40
P00>>> create -nv lp_mem_mode isolate
P00>>> show lp*   ❹
lp_count 3
lp_cpu_mask0 3
lp_cpu_mask1 c
lp_cpu_mask2 30
lp_io_mask0 100
lp_io_mask1 80
lp_io_mask2 40
lp_mem_mode isolate
P00>>> set boot_reset off   ❺
P00>>> set interleave none   ❻
P00>>> set os_type unix   ❼
P00>>> set auto_action halt
P00>>> init   ❽
```

Begin to define logical partitions by issuing commands from the primary console terminal. Example 4–2 shows a possible sequence. The steps are described below.

❶ Logical partitions require console firmware support. (See the *Systems and Options Catalog* for the version necessary.) If you have not already done so, verify that your system's console revision number is the minimum or greater by issuing the **show version** command. If the version is not at the desired level, you need to update the console firmware. Obtain a console CD with the latest version, and follow the instructions for the Loadable Firmware Update (LFU) utility, as described in the *AlphaServer GS140 or 8200/8400 Operations Manual* or the *AlphaServer GS60E Operations Manual*.

❷ Check to see if any **lp_** environment variables have been set for this system. The example shows none have yet been created. If they had, the display would have indicated variables and their settings.

❸ **Create** (or **set**, if the **lp_*** environment variables have already been created) the desired environment variables. **Create** (or **set**) the CPU and I/O masks to the values you want for each of your partitions. The example shows three partitions. Use whatever values needed for your partitioning scheme, as described in detail in Chapter 3.

❹ Issue a **show lp*** command to check the settings. If any mistakes were made in the settings, correct them at this point.

❺ Set the **boot_reset** environment variable to **off**. This is necessary so that booting a partition does not interfere with the operation of other, previously booted, partitions. If **boot_reset** were **on**, then a system-wide reset is done when the boot command is executed from any partition. This reset will immediately terminate operation of all partitions.

❻ Set the **interleave** environment variable to **none**.

❼ Set the environment variables pertaining to partition 0. In this case, the **os_type** and **auto_action** environment variables are set.

❽ Issue an **init** command to restart the system with the new environment variable settings.

4.3 Step 2: Initialize Partitions from the Primary Console; Boot/Install OS in Partition 0

Initialize partition 0 and then initialize the secondary partition(s). Boot and install the operating system in partition 0.

Example 4–3 Initializing the Partitions

```
P00>>> lpinit    ❶
 Partition 0: Primary CPU = 0    ❷
 Partition 1: Primary CPU = 2
 Partition 2: Primary CPU = 4
 Partition 0: Memory Base = 000000000   Size = 040000000  ❸
 Partition 1: Memory Base = 040000000   Size = 040000000
 Partition 2: Memory Base = 080000000   Size = 040000000
 No Shared Memory    ❹
 LP Configuration Tree = 128000
 starting cpu 2 in partition 1 at address 040010001  ❺
 starting cpu 3 in partition 1 at address 040010001
 starting cpu 4 in partition 2 at address 080010001
 starting cpu 5 in partition 2 at address 080010001
P00>>>  ❻
```

Following the system reset, you are still issuing commands at the primary console. Perform the following actions:

❶ Issue the **lpinit** command to start the secondary partitions. The primary console displays information on the partitions defined. The CPUs assigned to each partition are listed, the memory ranges assigned are listed, a check is made for interleaving, and the results displayed. Then the firmware starts the CPUs in each partition, and displays that information as the partitions "come alive." Initialization displays will begin to appear on the secondary consoles as well, as the separate initializations take place.

❷ As the partitions are initialized, the primary console displays information about the partitions. As shown here, the primary, or boot processor, of each partition is generally the lowest-numbered CPU in the partition.

❸ The base address and size of memory for each partition are listed.

❹ No shared memory indicates that the **lp_mem_mode** environment variable has been set to **isolate**.

❺ This section of the display shows the CPUs being started in the secondary partitions.

❻ You can now install (if the operating system has not yet been installed) or boot the operating system. See the *Tru64 UNIX Installation Guide* for more detail on booting and installing the operating system.

4.4 Step 3: Set and Initialize Environment Variables, Boot from Secondary Consoles

From each secondary console, set desired environment variables, initialize and boot the operating system.

Example 4–4 Using the Secondary Consoles

```
[initialization display]
P02>>> sho config    ❶

        Name                    Type   Rev   Mnemonic
   TLSB
   0++   KN7CG-AB               8025  0000  kn7cg-ab0
   1++   KN7CG-AB               8025  0000  kn7cg-ab1
   2++   KN7CG-AB               8025  0000  kn7cg-ab2
   3+    MS7CC                  5000  0B04  ms7cc0
   4+    MS7CC                  5000  0000  ms7cc1
   5+    MS7CC                  5000  0000  ms7cc2
   6+    KFTHA                  2000  0D03  kftha1
   7+    KFTHA                  2000  00D3  kftha0
   8+    KFTIA                  2020  0000  kftia0

   C4 PCI connected to kftha0              pci0     ❷
   0+    SIO                 4828086  0015  sio0
   3+    VGA                   D1011  0022  vga0
   5+    QLogic ISP1040B   10201077  0005  isp0
   6+    QLogic ISP1040B   10201077  0005  isp1
   7+    DECchip 21041-AA    141011  0021  tulip1
   8+    Mylex DAC960         11069  0000  dac0

     Controllers on SIO                    sio0
   0+    DECchip 21040-AA     21011  0024  tulip0
   1+    FLOPPY                   2  0000  floppy0
   2+    KBD                      3  0000  kbd0
   3+    MOUSE                    4  0000  mouse0
   4+    COM1                     5  0000  com1
   5+    COM2                     6  0000  com2
   6+    TOY                      7  0000  toy0

     EISA connected to pci0 through sio0   eisa0
P02>>> set os_type unix    ❸
P02>>> set auto_action boot
   .
   .
   .
P02>>> show dev    ❹
   .
   .
[locate the CD-ROM, if used to boot, and boot the operating system as you did
for partition 0]
```

Once **lpinit** is executed from the primary console, initialization displays appear at the secondary consoles.

❶ Note that the console prompt displays the processor number of the boot processor for the secondary partition. Example 4–4 shows the user issuing a **show config** command.

❷ Note that the **show config** displays the entire TLSB configuration, but only the I/O configuration for this particular partition. In the example, a PCI card cage is attached to hose C4 on the KFTHA in slot 7.

❸ Set any partition-specific local environment variables for the partition; that is, any environment variables whose values may be different than those for partition 0. These may include **os_type**, **auto_action**, **bootdef_dev**, **boot_osflags**, for example.

❹ You can now install (if the operating system has not yet been installed) or boot the operating system. See the *Tru64 UNIX Installation Guide* for more detail on booting and installing the operating system.

NOTE: *Do not try to change the **lp_*** environment variables from secondary consoles.*

Chapter 5
Tips and Troubleshooting

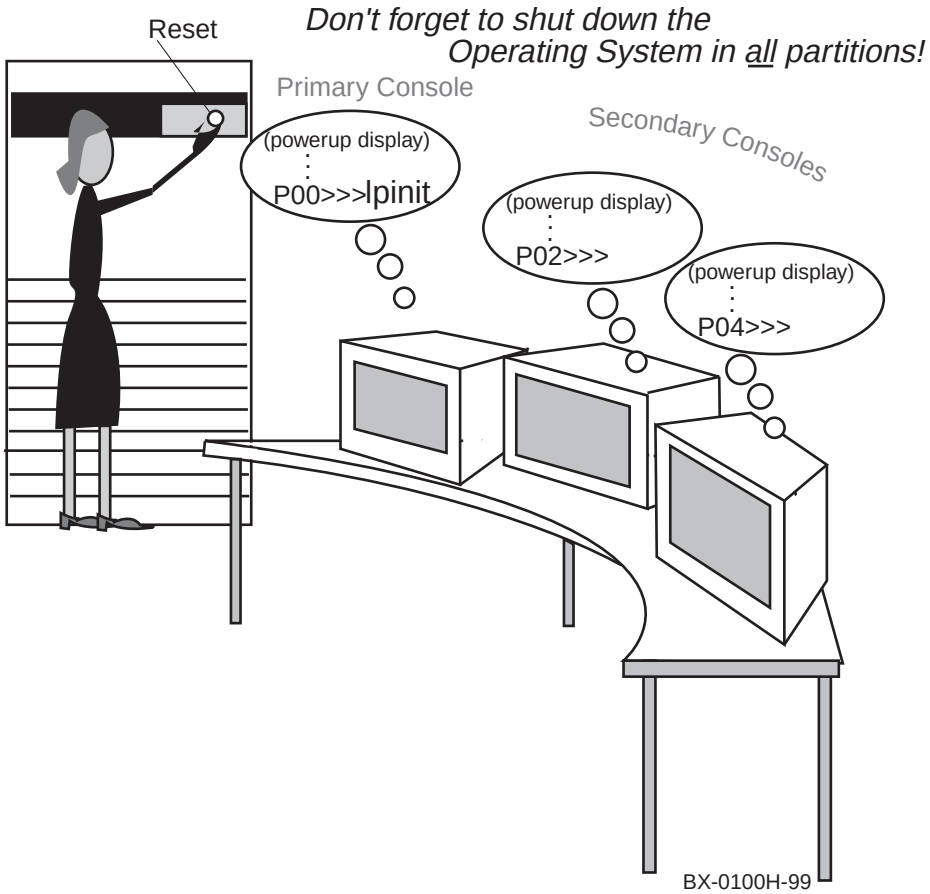
This chapter describes some things you may want to do after you have defined and initialized logical partitions on your system. Sections include:

- Setting **auto_action** within Partitions
- How to Stop a Hung Partition
- Halting All Partitions to Reconfigure
- Correcting Errors in Environment Variables
- Using Tools to Debug a Partition

5.1 Setting auto_action Within Partitions

Here are some tips on setting the auto_action environment variable for partitions.

Figure 5–1 Setting auto_action to Halt in Each Partition



In general, it is reasonable practice to set **auto_action** to **halt** in each partition when you are first starting up logical partitions. Once you are sure that the partitions have been defined as you wish, you can install and boot the operating system in each partition. Once you have partitions running smoothly, you can make changes to **auto_action** as desired.

Partition 0: auto_action Set to halt

If **auto_action** is set to **halt** in partition 0, then after partitions are initialized with the **lpinit** command, turning the keyswitch to Reset or issuing an **init** and answering "Y" to the prompt will cause the system to initialize with partitions disabled. The primary console will halt at the console prompt; secondary consoles are disabled. You may then perform whatever actions you wish, and issue an **lpinit** command to restart partitions as they were set previously, or as you have changed them at the primary console.

If **auto_action** was set to **halt** at the secondary consoles, the secondary partitions will initialize and halt at the console prompt. If **auto_action** was set to **boot** at the secondary consoles, the secondary partitions will initialize and boot the operating system.

Partition 0: auto_action Set to boot

If **auto_action** is set to **boot** in partition 0, then after partitions are initialized, turning the keyswitch to Reset or issuing an **init** and answering "Y" to the prompt will cause the firmware to initialize the system with partitions disabled. The firmware will then boot the operating system in the primary partition, and issue an **lpinit** automatically to restart partitions. The secondary partitions will come up.

If **auto_action** was set to **halt** at the secondary consoles, the secondary partitions will initialize and halt at the console prompt. If **auto_action** was set to **boot** at the secondary consoles, the secondary partitions will initialize and boot the operating system.

5.2 How to Stop a Hung Partition

You can halt a hung operating system instance in partition 0 by typing Ctrl/P at the primary console. You can halt a hung operating system instance in a secondary partition by issuing a stop *n* command from another partition.

Example 5–1 Halting a Hung OS Instance in Partition 0

```
    .
    .
    .
[operating system in partition 0 hung]
    .
    .
    .
<Ctrl/P>
P00>>>
```

Example 5–2 Halting a Hung OS Instance in Secondary Partitions

```
    .
    .
    .
[shut down operating system in partition 0]
    .
    .
    .
P00>>> sho lp_cpu_mask1
lp_cpu_mask1  c
P00>>> stop 2
P00>>>
```

CAUTION: *It is always recommended practice to* ***shut down the operating system before attempting to halt a partition****. This may not always be feasible, for instance, when an operating system instance is hung. The procedures described here refer to that situation.*

When an operating system instance hangs in partition 0, you can return to the console prompt by typing Ctrl/P at the primary console terminal, as shown in Example 5–1. The secondary partitions continue running. You can execute any console firmware commands *except* the **lpinit** command without disturbing the secondary partitions.

Example 5–2 shows how to halt execution of a hung operating system instance in a secondary partition. Shut down the operating system in another partition (in this case, partition 0) and use the **stop *n*** command there. You can determine the value of ***n*** by checking the **lp_cpu_mask** setting for the desired partition. The lowest even-numbered processor will be the primary processor for that partition. See the figure below for CPU numbers allocated to the five possible slots available when using partitioning. In Example 5–2, the CPU bit mask for partition 1 is set to c, indicating the two CPUs in slot 1, so the command **stop 2** is issued. The user can then reboot the operating system in partition 0, and go on to debugging at partition 1's secondary console.

Slot	4	3	2	1	0
Cpu No.	9 8	7 6	5 4	3 2	1 0

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5.3 Halting All Partitions to Reconfigure

You may wish to change the allocations set with the lp_* environment variables, in effect reconfiguring your partitions. Shut down the operating system in each partition, reset the system, change the settings as desired, reset the system, and issue an lpinit command.

Example 5–3 All Consoles: Shut Down Operating System

```
# /usr/bin/shutdown –h +5 “Shutting down to reconfigure partitions”❶
```

Example 5–4 Primary Console: Disable Partitions and Reset EVs

```
P00>>> set lp_count 0  ❷
P00>>> init   ❸
Are you sure you want to reset ALL partitions? (Y/N)  Y
    .
    .
    .
P00>>> set lp_count 2   ❹
P00>>> set lp_cpu_mask0 3
P00>>> set lp_cpu_mask1 30
P00>>> set lp_io_mask0 100
P00>>> set lp_io_mask1 c0
P00>>> set lp_mem_mode isolate
P00>>> set auto_action halt
P00>>> init   ❺
    .
    .
    .
P00>>> lpinit   ❻
CPU 2, 3 not configured in any partition   ❼
Partition 0:  Primary CPU 0
Partition 1:  Primary CPU 4
Partition 0 Memory Base 0000000000 Size 080000000
Partition 1 Memory Base 0800000000 Size 040000000
No Shared Memory
LP Configuration Tree 132000
Starting CPU 4 in partition 1 at address 080010001
Starting CPU 5 in partition 1 at address 080010001
```

❶ Shut down the operating system, using a command such as this one, at each of the primary and secondary console terminals.

❷ Set the **lp_count** environment variable to 0 and issue an **init** to disable partitioning on the system.

❸ You must use an **init** to reset the system so that all CPUs again run in partition 0. This will cause the environment variable changes made to be copied later to the CPUs in the secondary partitions when they are later initialized. Answer "yes" to the prompt asking if you really want to reset partitions.

❹ Set the other **lp_*** environment variables as desired. In this case, the example shows redefining the 3-partition system from previous chapters to a 2-partition system. You do not have to reset the CPU and I/O bit masks for the old partition 2; they will be ignored because **lp_count** is set to 2.

❺ Initialize the primary partition.

❻ Initialize the secondary partitions.

❼ A message appears noting that CPUs 2 and 3 have not been assigned to any partition. (We correct this error in the next section.)

5.4 Correcting Errors in Environment Variables

It is easy enough to make a mistake in setting bit masks for the lp_* environment variables. When you initialize partitioning, any unallocated modules or doubly allocated modules will be noted at the primary console.

Example 5–5 Correcting a Bad Bit Mask

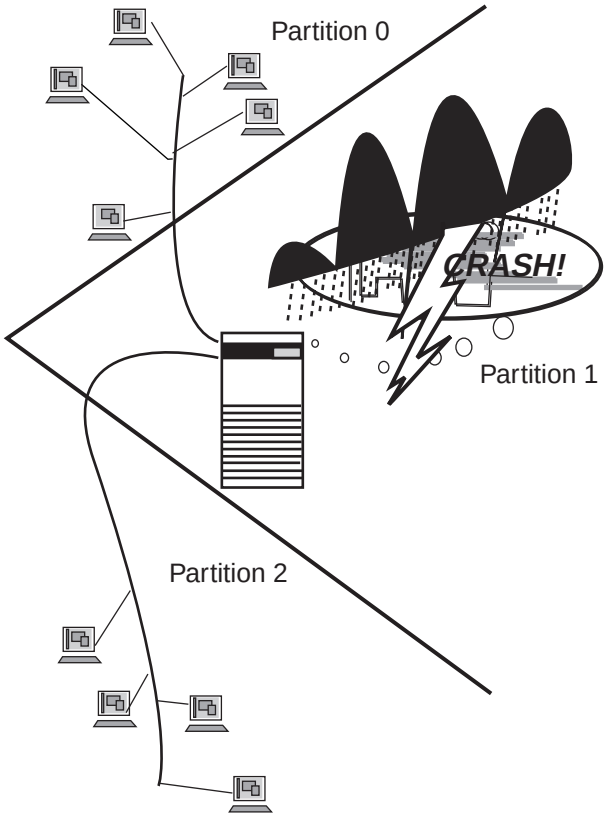
```
P00>>> init    ❶
Are you sure you want to reset ALL partitions? (Y/<N>) Y
   .
   .
   .
P00>>> set lp_cpu_mask0 f  ❷
P00>>> lpinit
```

Continuing from the previous section, where the console firmware revealed that CPUs 2 and 3 were not assigned to any partition, do an **init** to reset all partitions (❶). At ❷, correct the bit mask for partition 0 to include CPUs 2 and 3, and issue an **lpinit** to initialize the partitions.

5.5 Using Tools to Debug a Partition

You can analyze crash dumps and run DECevent from a partition while other partitions are operating normally.

Figure 5–2 Debugging One Partition



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A partition can crash, while other partitions remain up and running. You can use the same tools to debug the problem partition as you would for a non-partitioned system. You must first ensure that the tool has been installed on each partition. For information on how to install DECevent, see the *DECevent Installation Guide.*

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